CLAIMS

What is claimed is:

1. A rotary disk refiner for refining fiber in a liquid stock comprising:

a housing having a stock inlet;

a rotor within the housing that rotates about an axis of rotation during operation and which has a first refiner plate mounting surface;

a second refiner plate mounting surface within the housing that opposes the rotor;

a first refiner plate carried by the first refiner plate mounting surface, the first refiner plate comprised of a plurality of pairs of upraised refiner bars that define grooves therebetween that collectively form a first refining surface;

a second refiner plate carried by the second refiner plate mounting surface, the second refiner plate comprised of a plurality of pairs of upraised refiner bars that define grooves therebetween that collectively form a second refining surface, wherein the second refiner plate opposes and is spaced from the first refiner plate, and wherein a refining zone is defined between the opposed refining surfaces of the first and second refiner plates; and

wherein one of the refiner plates has one portion of its refining surface that is movable relative to another portion of its refining surface.

2. The rotary disk refiner of claim 1 wherein the portion of the refining surface is movable relative to the another portion of the refining surface such that the angle of the refiner bars of the one portion of the refining surface relative to the angle of refiner bars of the another

portion of the refining surface is changeable.

3. The rotary disk refiner of claim 1 wherein the one portion of the refining zone is moveable such that it is axially displaceable relative to the another portion of the refining zone.

4. The rotary disk refiner of claim 3 further comprising a biasing element disposed behind the one portion of the refining zone that is compressible, the biasing element permitting axial displacement of the first portion of the refining surface relative to the another portion of the refining surface.

5. The rotary disk refiner of claim 4 wherein the biasing element comprises a spring.

6. The rotary disk refiner of claim 5 wherein the biasing element comprises a coil spring that is disposed between the one portion of the refining surface and the first and second refiner plate mounting surfaces carrying the one of the refiner plates.

7. The rotary disk refiner of claim 6 wherein the one of the refiner disks is removably mounted by fasteners to one of the refiner plate mounting surfaces.

8. The rotary disk refiner of claim 1 wherein the one portion of the refining surface is moveable such that the angle of its refining surface relative to the refining surface of the another portion can be changed by changing the angle of its refiner bars relative to the angle of the refiner bars of the refining surface of the another portion, and changing of the angle of the refiner bars of the refining surface of the one portion relative to the angle of the refiner bars of the refining surface of the another portion is resisted during refiner operation.

9. The rotary disk refiner of claim 1 wherein the one portion of the refining surface is moveable such that (a) it is axially displaceable relative to the another portion of the refining surface, and (b) the angle of its refining surface can be changed relative to the refining surface of the another portion thereby changing the angle of its refiner bars relative to the angle of the refiner bars of the refining surface of the another portion, and wherein changing of the angle of the refiner bars of the refining surface of the one portion relative to the angle of the refiner bars of the refining surface of the another portion is resisted during refiner operation.

10. The rotary disk refiner of claim 1 wherein the one portion of the refining surface is moveable such that (a) it is axially displaceable relative to the another portion of the refining surface and (b) the orientation of its refining surface can be changed relative to the refining surface of the another portion.

11. The rotary disk refiner of claim 1 wherein the one portion of the refining surface is moveable such that it is axially displaceable relative to the another portion and has a plurality refiner bars whose angle can be changed relative to the refiner bars on the another portion.

12. The rotary disk refiner of claim 1 wherein the one portion of the refining surface is comprised of an insert that has a plurality of refiner bars.

13. The rotary disk refiner of claim 12 wherein the insert is circular and can be turned to change the angle of the plurality of the refiner bars of the insert relative to the plurality of refiner bars of the another portion of the refining surface.

14. The rotary disk refiner of claim 12 wherein the insert comprises an indexable insert.

15. The rotary disk refiner of claim 14 wherein the indexable insert is shaped like a square, an equilateral triangle, a pentagon, or an octagon.

16. The rotary disk refiner of claim 12 wherein the one of the refiner plates has a pocket that defines a window in the another portion of its refining surface and wherein the insert is received in the pocket and the refining surface of the one portion of the refining surface is defined by the refiner bars of the insert.

17. The rotary disk refiner of claim 16 wherein the insert further comprises a base that is larger than the refining surface of the insert to prevent removal of the insert through the window in the refining surface of the another portion.

18. The rotary disk refiner of claim 16 wherein one of the insert and the one of the refiner plates has a detent and the other one of the insert and the one of the refiner plates has a plurality of spaced apart detent notches that is each capable of receiving a detent when the insert is received in the pocket and permits the insert to be indexed.

19. The rotary disk refiner of claim 16 wherein the insert has a base with a back surface and the refiner bars carried by a front surface, and wherein the insert further comprises a portion that extends outwardly from the base so as to bear against a portion of the one of the refiner plates to oppose removal of the insert through the window.

20. The rotary disk refiner plate of claim 16 wherein the one of the refiner plates has (a) a front with a front surface that comprises its refining surface and (b) a rear with a rear surface, and wherein the pocket in the one of the refiner plates extends completely through the one of the refiner plates, permitting insertion or removal of the insert from the rear of the one of the refiner plates.

21. The rotary disk refiner plate of claim 20 wherein the insert has a base with an outwardly extending portion, and adjacent the rear of the one of the refiner plates the pocket comprises an outwardly extending well that receives the outwardly extending portion of the base of the insert with the outwardly extending portion of the base of the insert preventing removal of the insert through the window.

22. The rotary disk refiner plate of claim 21 wherein the well comprises a counterbore or a countersink.

23. The rotary disk refiner plate of claim 22 wherein the outwardly extending portion of the base comprises a flange that extends outwardly about the periphery of insert and that engages the one of the refiner disks to prevent removal.

24. The rotary disk refiner plate of claim 1 wherein the one portion of the refining surface is comprised of an insert that is captured by the one of the refiner disks and the refiner plate mounting surface to which it is mounted.

25. The rotary disk refiner plate of claim 24 further comprising a biasing element between the insert and the refiner plate mounting surface to which the one of the refiner disks is mounted, wherein the biasing element urges the insert outwardly.

26. The rotary disk refiner plate of claim 24 further comprising a biasing element between the insert and the refiner plate mounting surface to which the one of the refiner disks is mounted, wherein the biasing element urges the insert outwardly such that the edges of the refiner bars of the insert are substantially flush with the edges of the refiner bars of the another portion of the refining surface.

27. The refiner disk of claim 1 further comprising (a) a plurality of guides that extend axially outwardly, (b) a plurality of bores in the one portion of the refining surface with one of the guides received in one of the bores and another one of the guides received in another one of the bores, and (c) a biasing element disposed rearwardly of the one portion of the refining surface.

28. The refiner disk of claim 27 wherein there are a plurality of the biasing elements with one of the biasing elements carried by one of the guides and another one of the biasing elements carried by another one of the guides.

29. The refiner disk of claim 28 wherein at least one of the guides comprises a fastener that has a head at one end and an axial groove at an opposite end that communicates with a groove that extends transverse to the axial groove.

30. The refiner disk of claim 29 wherein the fastener is disposed in a bore in one of the refiner plate mounting surfaces to releasably mount the one portion of the refining surface to the one of the refiner plate mounting surfaces and wherein there is a finger disposed in the bore that engages the fastener to retain the fastener in the bore.

31. The refiner disk of claim 30 wherein the one of the refiner plate mounting surfaces further comprises a mounting surface of the refiner and a backing plate disposed between the one portion of the refining surface and the mounting surface of the refiner plate.

32. The refiner disk of claim 31 wherein the bore is disposed in the backing plate and the backing plate is attached to the mounting surface of the refiner plate.

33. The refiner disk of claim 28 wherein at least one of the guides comprises a fastener that engages one of the refiner plate mounting surfaces to removably attach the one portion of the refining surface to the one of the refiner plate mounting surfaces.

34. The refiner disk of claim 33 wherein the fastener is disposed in a pocket in the one of the refiner plate mounting surfaces that is defined by a sidewall, and one of the fastener and pocket sidewall has an axial groove that is connected to a transverse groove and the other one of the fastener and the pocket sidewall has detent that is received in the groove to releasably engage the fastener and the one of the refiner plate mounting surfaces.

35. The refiner disk of claim 34 wherein the pocket is disposed in the backing plate and the backing plate is attached to the mounting surface of the refiner.

36. The refiner disk of claim 27 wherein at least one of the guides comprises a fastener that engages one of the refiner plate mounting surfaces to removably attach the one portion of the refining surface to the one of the refiner plate mounting surfaces.

37. The refiner disk of claim 1 further comprising a fastener that has a shank that is disposed in a pocket in one of the refiner plate mounting surfaces, the pocket defined by a sidewall, to removably mount one of the portions of the refining surface to the one of the refiner plate mounting surfaces wherein one of the fastener and the pocket sidewall has a groove with a first axial portion connected to a transverse portion that is connected to a second axial portion groove and the other one of the fastener and the pocket sidewall has a detent that is received in the second axial portion of the groove to releasably engage the fastener with the one of the refiner plate mounting surfaces.

38. The refiner disk of claim 1 wherein the one of the refiner plates is comprised of a plurality of segments that each have an outer annular section that is axially displaceable and an inner annular section that is disposed radially inwardly of the outer annular section and which is axially displaceable.

39. A refiner disk for a rotary disk refiner that refines fiber in a liquid slurry comprising:

an annular plate with a refining surface that has a plurality of pairs of refiner bars extending outwardly therefrom and a pocket that defines a window in the refining surface;

an insert received in the pocket, the insert having a refining surface with a plurality of refiner bars that are adjacent the refiner bars of the plate when the insert is received in the pocket; and

wherein the insert can be rotated relative to the plate to change the angle of the refiner bars of the insert relative to the angle of the refiner bars of the plate.

40. The refiner disk of claim 39 wherein the insert is removably received in the pocket and the refiner bars of the insert are substantially flush with the refiner bars of the plate.

41. The refiner disk of claim 40 wherein the plate is comprised of segments and each segment has a pocket with an insert disposed in the pocket.

42. The refiner disk of claim 39 further comprising a refiner plate mounting surface to which the plate is mounted, wherein the insert is releasably captured between a portion of the plate and the mounting surface.

43. The refiner disk of claim 42 further comprising a spring disposed between the insert and the mounting surface that permits the insert to be displaced toward the mounting surface.

44. The refiner disk of claim 39 wherein the insert is circular and has a base with an outwardly extending portion that interferes with the plate to prevent removal of the insert from the plate.

45. The refiner disk of claim 44 wherein the outwardly extending portion extends about the periphery of the circular insert.

46. The refiner disk of claim 39 wherein the insert is indexable.

47. The refiner disk of claim 45 wherein the pocket is defined by a sidewall and one of the indexable insert and the plate sidewall have a plurality of detents and the other one of the indexable insert and the plate sidewall have a plurality of detent-receiving notches each of which is capable of receiving a detent.

48. The refiner disk of claim 39 wherein the annular plate is comprised of a plurality of segments with one of the segments having a plurality of the inserts.

49. A refiner disk segment for removably mounting to a refiner plate mounting surface of a rotary refiner comprising:

a first section that is axially displaceable relative to the refiner plate mounting surface; and

a second section that is axially displaceable relative to the refiner plate mounting surface and relative to the first section.

50. The refiner disk segment of claim 49 wherein the first section is disposed radially outwardly of the second section.

51. The refiner disk segment of claim 50 wherein the first section extends annularly from one radial edge of the segment to the other radial edge of the segment and the second section extends annularly from the one radial edge of the segment to the other radial edge of the segment.